For good measure, two instructive appendices are added: *A*. Measures of Skulls of 93 Indians from Southern New England; *B*. Bodily Measures of 100 Female College Students.

GEORGE GRANT MACCURDY
YALE UNIVERSITY,
NEW HAVEN, CONN.

THE PRODUCTION OF BIOLOGICAL STAINS IN AMERICA

BACTERIOLOGISTS, during the war time, were often hindered in important work, sometimes involving matters of health control, by the lack of dyes which they were accustomed to use for staining. Some laboratories were provided with a sufficient supply of Grübler stains to use all through the war and are only now running out of this supply; but others were early forced to buy stains of American manufacture. Some of the American stains were so poor as to be unhesitatingly condemned, others although enough for some purposes were not suitable for the particular objects of bacteriologists, while others were so variable as to be unreliable.

Now that the war is over, biological scientists and their supply houses are faced with the problem whether to urge the importation again of German stains (which can now be done only with special permit) or to encourage the establishment of an American source of supply. As scientists we have no objection to the use of German-made materials, and if no other solution of the problem can be found we will be willing enough to consider the Grübler stains standard again, as soon as they can be freely obtained. From the standpoint of national independence, however, it seems well first to see what American producers can do for us in this line, especially when it is considered that certain stains are important to public health and that we ought to be able to count on an uninterrupted supply if there should ever be a new national emergency when importation would become impossible.

The Committee on Bacteriological Technic was asked by the Society of American Bacteriologists to look up the matter, to see whether reliable stains can be obtained in this country and further to see what can be done to protect bacteriologists against the unsatisfactory stains that are put upon the market. Upon looking into the situation we find that all the bacteriological dyes, and nearly the whole list of biological anilins are produced in America in reliable form. The chief difficulty is that there are too many competitors in the field for such a small line of business. Grübler apparently examined all the available textile dyes and determined which were useful to biologists, standardizing them so that the stains bearing his name were uniform. Then he sold them at a high percentage profit, but a perfectly legitimate profit, considering the labor he saved biologists by the study he gave the subject. A number of American concerns, attracted by the great difference between the cost of crude dyes and the price of biological stains, have thought to realize quite a profit from the business, and have begun the "manufacture and standardization" of biological dyes—often to their own discomfiture, but always to the discomfiture of the users of the stains. For a while there was success for all, because a scientist would give any firm a single test; but the result was a needless duplication of dyes of the same name, sometimes alike, but often different, and also the introduction of new names for old dyes. Although some of these concerns are now going out of business, the confusion still remains.

Gradually the users, or at least the distributors, have been learning which houses are manufacturing the most satisfactory stains, and the less reliable manufacturers have been forced out of the business. But the present situation is such that the future importation of German stains is no longer regarded as impossible. Fearing competition from abroad as well as from the unreliable concerns at home, some of the best producers of biological stains are becoming discouraged and are abandoning the effort to increase their line. Under these circumstances the only way to assure the continued domestic

production of stains is through the cooperation of scientists. After determining some one reliable line of stains we should make this line standard as the Grübler stains were once, and discourage the entrance of new manufacturers into this rather limited field. The line selected as standard need not be all the output of any one laboratory; but the production of *any one stain* in several different laboratories is an unnecessary waste of effort. All the distributors of stains are anxious to avoid this sort of duplication, and whenever one has been approached in the matter, most hearty cooperation has been assured us.

To carry out this program means considerable preliminary work to determine which of the domestic sources of each stain is the most reliable. Although we have considerable light on this subject already, and can in many cases make private suggestions of possible value to purchasers, we have not as yet the data necessary for making any official statement. We are now planning a series of tests of the most important bacteriological dyes in a considerable number of different laboratories, the outcome of which may determine our future action in the matter. As a society of bacteriologists we are of course primarily interested in the most commonly used bacterial stains, such as fuchsin, methylen blue, the gentian violet group, and the prepared blood stains. Secondarily, however, we are interested in securing the cooperation of other biologists in an attempt to standardize eventually the whole field.

This article is being written in the hopes of securing this cooperation. We wish to invite other biologists as individuals and through their organizations to work with us in the matter. Any one interested in our purpose is urged to communicate with the committee.

H. J. Conn, *Chairman*,
Committee on Bacteriological Technic, of the Society of American Bacteriologists
Agricultural Experiment Station,
Geneva, N. Y.,
March 1, 1921

SPECIAL ARTICLES

THE STRUCTURE OF THE STATIC ATOM

In attempting recently to derive the conditions which determine the stability of chemical molecules I was impressed by the importance of the part played by Coulomb's law of inverse square forces between charged particles. In fact, by considering a static arrangement of electrons according to the models which I proposed two years ago, and calculating the total potential energy by Coulomb's law, I have found it possible not only to determine the relative stability of various substances but to calculate with reasonable accuracy the heats of formation of compounds even of widely varying types.

In all such calculations, however, it is necessary to assume that the electrons are kept from falling into the nucleus by some undetermined force, for Coulomb's law alone can not account for this. According to Bohr's theory of atomic structure, the requisite repulsive force is nothing more than centrifugal force due to rotation of the electrons about the nucleus. This theory has been so remarkably successful in accounting for the spectra of hydrogen and helium that the fundamental assumption of movement about the nucleus has seemed justified, notwithstanding the fact that this violates all our classical laws regarding the radiation of energy from accelerated electrons.

From the chemical point of view it is a matter of comparative indifference what the cause of the repulsive force is, so long as it exists. I therefore endeavored to find what law of repulsive force between electrons and positive nuclei would produce an effect equivalent to the centrifugal force of Bohr's theory.

According to Bohr the average kinetic energy in any atom or molecule is half as great as the average potential energy, but opposite in sign. I therefore now assume that this energy, which Bohr called kinetic, is another form of potential energy dependent upon certain quantum changes in the electron.